

ELECTRIC TOOTHBRUSH

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Background of the Invention

This application is a continuation of Application Serial No. 10/082,503, filed February 25, 2002, which is a continuation of 09/766,703, filed January 22, 2001, which is a continuation of Application Serial No. 09/382,745, filed August 25, 1999, now U.S. Patent No. 6,168,579 B1, which is a continuation-in-part of Application Serial No. 09/236,794, filed January 25, 1999, now U.S. Patent No. 6,189,693B1, which is a continuation-in-part of Application Serial No. 09/163,621, filed on September 30, 1998, now U.S. Patent No. 6,000,083, the substances of which are incorporated herein by reference.

The present invention relates generally to electric toothbrushes. More particularly, it relates to an improved battery powered toothbrush.

The benefits of brushing one's teeth using motorized toothbrushes are well known, and motorized movement in toothbrushes has been the subject of much recent innovation and design activity. Also, the commercial market has seen the introduction, over the last several years, of many different types of motorized toothbrushes. However, an examination of the available technology shows a tendency toward increasingly complex, expensive, and non-commercially feasible methods of achieving motorized motions in the bristles and heads of toothbrushes to aid in more effectively cleaning one's teeth.

The commercial marketplace has become divided into two price markets. On the higher priced end are some of these more complex motorized toothbrushes that provide various motions to the bristles and brush head. The lower end of the market has become the province of very simple motorized toothbrushes that only vibrate through the use of an offset weight attached to the motor shaft, and which provide very little true additional cleaning benefit with their use, since no vigorous motion is transmitted to the cleaning surface of the brush. The vibrations are also very uncomfortable to the hand and act as a disincentive to brush one's teeth for an adequate time.

5 Numerous electric toothbrushes have been developed over the years. Some known devices are shown in U.S. Patent No. 5,070,567; U.S. Patent No. 5,186,627; U.S. Patent No. 5,274,870; U.S. Patent No. 5,341,534; U.S. Patent No. 5,378,153; and U.S. Patent No. 5,732,433. The intention of the present invention is to provide a low cost, effective, ergonomically correct, motorized toothbrush wherein the brush includes both a moving
 10 circular brush portion and a fixed brush portion. Accordingly it has been considered desirable to develop a new and improved electric toothbrush which would overcome the foregoing difficulties and others while providing better and more advantageous overall results.

15 Summary of the Invention

An electric toothbrush is provided. The electric toothbrush includes an elongate body having a handle portion, a head portion having a longitudinal axis, and an elongate intermediate portion disposed between the handle portion and the head portion. The head portion has a first end that is located at a position furthest from the handle portion and a
 20 second end opposite the first end that is disposed adjacent the elongate intermediate portion. The head portion has moving bristles that are disposed in a moving portion that oscillates and a static portion that extends from adjacent the moving portion to the second end of the head portion. The moving portion is disposed at the first end of the head portion and the static portion has a plurality of static bristles arranged in plurality of tufts. A motor is disposed in
 25 the handle portion and a shaft extends from the second end of the head portion to beyond the plurality of tufts of static bristles. The shaft is operatively connected to the motor and to the moving portion to cause the moving portion to oscillate about an axis approximately normal to the longitudinal axis of the head portion.

30 Brief Description of the Drawings

The invention may take physical form in certain parts and arrangements of parts, preferred embodiments of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof, and wherein:

35 FIG. 1 is a perspective view of the electric toothbrush in accordance with a first preferred embodiment of the present invention;

FIG. 2 is a side elevational view of the electric toothbrush of FIG. 1;

- 5 **FIG. 3** is a bottom elevational view of the electric toothbrush of **FIG. 1**;
 FIG. 4 is a side elevational view in cross section of the electric toothbrush of **FIG. 1**;
 FIG. 5 is an exploded perspective view of the electric toothbrush of **FIG. 1**;
 FIG. 6 is an enlarged side elevational view in cross section of the motor and gear
 assembly of the electric toothbrush of **FIG. 1**;
 10 **FIG. 7** is an enlarged side elevational view in cross section of the head of the electric
 toothbrush of **FIG. 1**;
 FIG. 8 is a front and side elevational view of the electric toothbrush in packaging;
 FIG. 9 is a perspective view of the electric toothbrush in accordance with a second
 preferred embodiment of the present invention;
 15 **FIG. 10** is a side elevational view of the electric toothbrush of **FIG. 9**;
 FIG. 11 is a bottom elevational view of the electric toothbrush of **FIG. 9**.
 FIG. 12 is a perspective view of the electric toothbrush in accordance with a third
 preferred embodiment of the present invention.

20 **Detailed Description of the Preferred Embodiments**

Referring now to the drawings wherein the showings are for the purposes of illustrating
 the preferred embodiments of the invention only and not for purposes of limiting same, **FIG.**
1 shows an electric toothbrush A according to a first preferred embodiment of the present
 invention. The electric toothbrush can be used for personal hygiene such as brushing one's
 25 teeth and gums.

As shown in **FIG. 1**, the electric toothbrush includes an elongated body portion 10,
 which has a first end 12 and a second end 14. A head 16 is attached to the first end 12 and a
 handle 18 is attached to the second end 14.

The head 16 has a more traditional larger brush head shape which permits the user to
 30 brush his teeth in the typical manner of an up and down fashion. As shown on **FIG. 2**, the
 length of the head 16, dimension "X", can range from about .75 inches to about 1.75 inches.
 The thickness of the brush head, dimension "Y", can range from about .25 inches to about
 .50 inches. The design of the head 16 allows for inexpensive manufacture and assists in
 bringing effective motorized rotational toothbrushes within the financial reach of a large
 35 portion of the population.

5 Referring now to **FIG. 3**, the head **16** further includes a longitudinal axis **19**, a circular or moving portion or brush head **20** and a static portion or brush head **22**. The static portion **22** is located on opposite sides of the circular portion **20**. The circular portion **20** is located at the center of the brush head **16**. The circular portion **20** rotates, swivels, oscillates or reciprocates about an axis approximately normal to the longitudinal axis **19** of the brush head

10 **16**. The circular portion **20** may rotate 360° or partially rotate or oscillate or reciprocate in a back and forth manner.

The circular portion **20** includes stiff bristles **24**. The static portion **22** includes soft bristles **26**. The stiff bristles **24** are slightly recessed with respect to the soft bristles **26**. The stiff bristles **24** aid in the deep cleaning and plaque removal process, while the stationary soft

15 bristles **26** are softer so as to not damage the gums. The thickness of the bristles, dimension "Z", shown in **FIG. 2**, can range from about .25 inches to about .75 inches.

Referring again to **FIG. 3**, the elongated body portion **10** further includes an angled shaft **28**, located between the head **16** and the handle **18**. The angled shaft **28** provides an ergonomic benefit that has not been utilized on a motorized toothbrush. The angle is well

20 known for its ergonomic benefit in permitting easier access into the back recesses of the mouth while still contacting the tooth surface.

As shown in **FIG. 4** and **FIG. 5**, the elongated body portion **10** further includes a hollow portion **30** which houses a motor **32**. The motor **32** has a longitudinal axis **34** in line with a longitudinal axis **36** of the elongated body portion **10**.

25 To provide power to the circular portion **20** to rotate or oscillate or reciprocate, the motor **32** powers a worm gear **40** and a pair of step gears **42, 43**. The motor **32** is operatively connected to the worm gear **40**. Step gear **42** is operatively connected to step gear **43** and the worm gear **40**.

As shown in **FIG. 4** and **FIG. 6**, the first step gear **42** permits the matching second step

30 gear **43** to be offset with respect to the longitudinal axis **36** of the elongated body portion **10**.

As shown in **FIGS. 4, 6** and **7**, a shaft **44** is connected at a first end to the offset step gear **43** and at a second end to the circular portion **20**. The second step gear **43** is placed at a desired angle so that the shaft **44** itself can still be straight, thus losing no power or torque through the added function of a flexible shaft.

35 Referring again to **FIG. 5**, the motor **32** and gears **40, 42, 43** are housed with an upper housing **46** and a lower housing **48**.

5 Referring again to FIG. 4, a switch 50 is provided to control operation of the electric toothbrush and is operatively connected to the motor 32. The switch 50 includes a molded actuator button 52 and a metal contact 54. The switch 50 is manually depressed by pressing a molded actuator button 52 down, which then presses against a metal contact 54, which completes the circuit and provides momentary operation of the toothbrush. The switch 50
10 also allows continuous operation through a ramp design, sliding the button 52 forward toward the head 16 to provide for continuous operation. Moving the button 52 forward, combined with a molded in ramp 58 in the metal contact 54, causes the button 52 to move downward, pressing against the metal contact 54 and completing the circuit. The toothbrush then continuously operates until the button 52 is slid back into an off position toward the
15 handle 18 and the button 52 disengages the metal contact 54.

By combining these two functions in one switch 50, the toothbrush can be packaged in packaging as shown in FIG. 8 where the consumer can depress the button 52 through the packaging and see its operation while still inside the packaging, and then be able to operate it continuously once out of the package. FIG. 8 illustrates one version of the button 52. It
20 should be noted that other sizes and shapes of buttons may be used.

Referring now to FIGS. 4 and 5, a battery 60 is provided within the hollow portion 30 of the elongated body portion 10. A battery terminal or contact 62 is provided for the battery 60. An AA battery can be used as is illustrated in FIG. 4. To install the battery 60 into the hollow portion 30, a slidable snap-on cover 64 is depressed and slid off the end of the handle
25 18 to expose the hollow portion 30. The battery 60 is inserted, then the cover 64 is slid back on to the housing and snapped into place. The terminal end of the battery 60 is then in contact with the metal contact 54.

If desired, depressions or grip areas 70 and 72 can be molded into the upper and lower housings 46, 48 as shown in FIG. 4. The depressions 70, 72 are used to support a user's
30 thumb and forefinger or other fingers to make using the electric toothbrush easier and more comfortable.

A second preferred embodiment of the electric toothbrush according to the present invention is shown in FIG. 9.

The electric toothbrush includes an elongated body portion 80, which has a first end 82
35 and a second end 84. A head 86 is attached to the first end 82 and a handle 88 is attached to the second end 84.

5 Referring now to **FIG. 11**, the head **86** further includes a longitudinal axis **90**, a circular or moving portion or brush head **100**, a static portion or brush head **102**, a first end **104**, and a second end **106**. The first end **104** is located adjacent the first end **82** of the elongated body portion **80**. The second end **106** is located opposite the first end **104**. The circular portion **100** is preferably located at the second end **106** of the brush head **86**. The static portion **102** is preferably located at the first end **104** of the brush head **86** adjacent the circular portion **100**. However, it is to be appreciated that the circular portion **100** and the static portion **102** can be arranged in different orientations. The circular portion **100** rotates, swivels, oscillates or reciprocates about an axis approximately normal to the longitudinal axis **90** of the brush head **86**.

15 The second preferred embodiment also has a worm gear **40** and a pair of step gears **42**, **43** as shown in **FIGS. 4 and 6**. The motor **32** powers the worm gear **40** and the pair of step gears **42,43**. The step gear **42** permits the matching step gear **43** to be offset with respect to the longitudinal axis of the elongated body portion **80**.

20 As shown in **FIGS. 4, 6, and 7**, a shaft **44** is connected at a first end to the offset step gear **43** and at a second end to the circular portion **100**. The second step gear **43** is placed at a desired angle so that the shaft **44** can still be straight, thus losing no power or torque through the added function of a flexible shaft.

25 Referring again to **FIG. 9**, a switch **130** is provided to control operation of the electric toothbrush and is operatively connected to the motor **32**. The switch **130** includes a molded actuator button **132**. The switch **130** is manually depressed by pressing a molded actuator button **132** down, which then presses against a metal contact **54**, which completes the circuit and provides momentary operation of the toothbrush. The operation of the switch **130** is identical to that shown in **FIGS. 4 and 6** and as described for the first preferred embodiment. The switch **130** also allows continuous operation through a ramp design, sliding the button **132** forward toward the head **86** to provide for continuous operation. The toothbrush then continuously operates until the button **132** is slid back into an off position toward the handle **88** and the button **132** disengages the metal contact **54**.

30 As shown in **FIGS. 4 and 5** for the first preferred embodiment, the second preferred embodiment also has a battery **60** with a battery terminal or contact **62** provided within the hollow portion **30** of the elongated body portion **80**. To install the battery **60** into the hollow portion **30**, a slidable snap-on cover **134** (shown in **FIGS. 9 - 11**) is depressed and slid off the

5 end of the handle 88 to expose the hollow portion 30. The battery 60 is inserted, then the cover 134 is slid back on to the housing and snapped into place.

If desired, raised grip areas 136 can be molded into the lower housing 124 as shown in FIG. 9 and FIG. 11. The raised portions 136 are used to support a user's thumb and forefinger or other fingers to make using the electric toothbrush easier and more comfortable.

10 Raised portion 140 may also be molded onto the snap-on cover 134 to aid in gripping the cover with one's thumb and removing the cover from the handle 88.

The electric toothbrush of the second preferred embodiment can also be packaged in packaging as shown in FIG. 8 as shown for the first preferred embodiment where the consumer can depress the button 132 through the packaging and see its operation while still inside the packaging, and then be able to operate it continuously once out of the packaging. A third preferred embodiment of the present invention is shown in FIG. 12.

The electric toothbrush includes an elongated body portion 150, which has a first end 152 and a second end 154. A head 160 is attached to the first end 152 and a handle 162 is attached to the second end 154.

20 The head 160 further includes a moving portion or brush head 164, a static portion or brush head 166, a first end 168, and a second end 170. As shown in FIG. 12, the moving portion 164 is located adjacent the second end 170. The static portion 166 is shown located adjacent the first end 168. However, it is to be appreciated that the moving portion 164 could be located adjacent the first end 168, and the static portion 166 could be located adjacent the
25 second end 170. Furthermore, the moving portion 164 could be positioned in the center of the brush head with static portions 166 on opposite sides of the moving portion 164 similar to that shown in FIG. 3.

In accordance with this embodiment, the moving portion 164 oscillates about an axis approximately normal to a longitudinal axis 172 of the elongated body portion 150.

30 The moving portion 164 can include stiff bristles 178. The static portion 166 can include soft bristles 180 which are softer than the stiff bristles. The stiff bristles 178 may be slightly recessed with respect to the soft bristles 180. The stiff bristles 178 aid in the deep cleaning and plaque removal process, while the stationary soft bristles 180 are softer so as to not damage the gums.

35 The elongated body portion 150 further includes an angled shaft 190, an upper housing 192 (not shown), and a lower housing 194. The angled shaft 190 is located between the head

5 160 and the handle 162. The angled shaft 190 provides an ergonomic benefit that has not been utilized on a motorized toothbrush.

 The elongated body portion 150 of the third preferred embodiment also includes a hollow portion 196, which houses a motor 200. The hollow portion 196 is formed between the upper housing 192 and the lower housing 194. The motor 200 provides power to the
10 moving portion 164 to rotate or oscillate or reciprocate. Power is provided to the motor by battery as shown and described for the first embodiment.

 A switch (not shown) can be provided which is similar to switch 130 shown in FIGS. 9 and 11 and which functions as described for the first and second preferred embodiments. The third embodiment further includes a first gear 202 which is operatively connected to and
15 powered by the motor 200. The first gear 202 rotates about the longitudinal axis 172 of the elongated body portion 150. A second gear 206 is operatively connected to the first gear 202. The second gear 206 is approximately normal to the first gear 202. The second gear 206 rotates about an axis approximately normal to the longitudinal axis 172. Teeth 208 of the first gear 202 mesh with teeth 210 of the second gear 206, thus causing second gear 206
20 to rotate when first gear 202 rotates.

 A first swivel arm 220 is pivotably connected to the second gear 206 via a pin 222 or other fastening device. A second swivel arm 224 is pivotably connected to the first swivel arm 220 via a pin 226 or other fastening device. A shaft 230 is fixedly secured at a shaft first end 232 to the second swivel arm 224. The shaft 230 is pivotably attached at a shaft second
25 end 234 to a third swivel arm 240. The shaft 230 is housed within the angled shaft 190.

 The shaft 230 is generally parallel with the longitudinal axis 172.

 A guide spacer 250 is located within the angled shaft 190 and surrounds the shaft 230 adjacent the first end 232 of the shaft 230 to minimize lateral movement of the shaft 230. A second guide spacer 252 is located adjacent the second end 234 of the shaft 230 to also
30 minimize lateral movement of the shaft 230. Guide spacers 250, 252 align the shaft 230 within the angled shaft 190 and minimize its movement from side to side within the angled shaft 190.

 The third swivel arm 240 has a first end 244 and a second end 246. The third swivel arm 240 is pivotably connected to the second guide spacer 252 at the swivel arm first end 244
35 via a pin 253. The third swivel arm 240 is connected at the swivel arm second end 246 to the

5 moving portion 164 via a pin 254 or other fastening device. The pin 254 is connected to a disk 256 of the moving portion 164, which is housed within the head 160.

As the first gear 202 rotates, the second gear 206 is rotated, thus moving the first swivel arm 220 in a back and forth circular fashion about the second gear 206 and along the longitudinal axis 172. The first swivel arm 220 also can pivot about the pin 222. The first
10 swivel arm 220 retains its orientation of approximately parallel to the longitudinal axis 172 of the elongated body portion 150 during movement. The second swivel arm 224 pivots with respect to its pin connection 226 with the first swivel arm 220 thus allowing the shaft 230 to oscillate in a back and forth manner toward and away from the brush head with minimal lateral motion.

15 During operation, the third swivel arm 240 moves back and forth along the longitudinal axis 172 of the elongated body portion 150 along with the shaft 230.

The swivel arm 240 can also pivot or move slightly laterally in a direction perpendicular to the longitudinal axis.

The third swivel arm 240 has an offset arm 260 which is offset from the longitudinal
20 axis 172 and moves the disk 256 of the moving portion 164 in a partially rotating or oscillating motion. As the third swivel arm 240 moves back and forth, the offset arm 260 moves along an outside edge 262 of the disk 256 in a partially rotating or oscillating fashion about an axis which is approximately normal to the longitudinal axis 172. This causes the bristles 178 to also move in a partially rotating or oscillating manner about an axis
25 approximately normal to the longitudinal axis 172.

When the third swivel arm 240 rotates, the disk 256 also rotates about an axis approximately normal to the elongated body portion longitudinal axis 172. The third, swivel arm 240 also retains its orientation of approximately parallel to the elongated body portion longitudinal axis 172 during movement.

30 If desired, raised grip areas (not shown) can be provided which are similar to raised grip areas 138 and 140 shown in FIG. 9 and FIG. 11 for the second preferred embodiment. The raised grip areas can be molded into the lower housing 194.

The electric toothbrush of the third preferred embodiment can also be packaged in packaging as shown in FIG. 8 as shown for the first preferred embodiment. The consumer
35 can depress a button (not shown) similar to button 132 shown in FIG. 9 and FIG. 11 for the

5 second preferred embodiment through the packaging and see its operation while still inside the packaging, and then be able to operate it continuously once out of the packaging.

The invention has been described with reference to the preferred embodiments. Obviously, modifications and alterations will occur to others upon a reading and understanding of this specification. It is intended to include all such modifications and
10 alterations insofar as they come within the scope of the appended claims or the equivalents thereof.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention.
15 It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed is:

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